We claim:

1. A process for improving a combustion system for burning solid fuel particles in a combustion chamber and creating a flue gas, the method comprising:

creating a fuel gas stream by mixing the solid fuel particles with a conveying gas;

transporting the fuel gas stream through a fuel duct terminating at the combustion chamber at a fuel exit plane;

injecting an oxygen stream through an injection device into said fuel gas at an oxygen injection location selected to create a mixing zone to mix the oxygen stream and the fuel gas stream proximate to the fuel exit plane.

2. The process of claim 1, further comprising selecting the injection device to enhance mixing of the oxygen stream and the fuel gas stream to reduce the formation of NO_x during combustion of the fuel.

3. The process of claim 1, further comprising:

selecting a target O_2 content in the flue gas;

selecting the O_2 content of the oxygen stream;

selecting the flowrate of conveying gas desired to maintain the solid fuel particles and the conveying gas in mixed relation so that the fuel gas stream can be transported through the fuel duct to the combustion chamber without separation; and

adjusting the total amount of oxygen entering the combustion chamber to yield the target O_2 content in the flue gas.

4. The process of claim 1, further comprising:

selecting the injection device to enhance mixing of the oxygen stream and the fuel gas stream to reduce the formation of NO_x during combustion of the fuel;

selecting a target O_2 content in the flue gas;

selecting the O_2 content of the oxygen stream;

selecting the flowrate of conveying gas desired to maintain the solid fuel particles and the conveying gas in mixed relation so that the fuel gas stream can be transported through the fuel duct to the combustion chamber without separation; and

adjusting the total amount of oxygen entering the combustion chamber to yield the target O_2 content in the flue gas.

5. The process of claim 3, the target O_2 content in the flue gas being selected to be between 1.5 percent and 4.5 percent by volume of the flue gas.

6. The process of claim 3, the target O_2 content in the flue gas being selected to be between 2.5 percent and 3.5 percent by volume of the flue gas.

7. The process of claim 3, the target O_2 content in the flue gas being selected to be about 3.0 percent by volume of the flue gas.

8. The process of claim 4, the target O_2 content in the flue gas being selected to be between 1.5 percent and 4.5 percent by volume of the flue gas.

9. The process of claim 4, the target O_2 content in the flue gas being selected to be between 2.5 percent and 3.5 percent by volume of the flue gas.

10. The process of claim 4, the target O_2 content in the flue gas being selected to be about 3.0 percent by volume of the flue gas.

11. The process of claim 1 wherein said conveying gas is air.

12. The process of claim 1 wherein said conveying gas is a mixture of natural gas and air.

13. The process of claim 1 wherein said conveying gas comprises air and recirculated flue gas.

14. The process of claim 1 wherein said conveying gas is a mixture of oxygen and recirculated flue gas.

15. The process of claim 14 wherein the conveying gas comprises about 20% oxygen.

16. The process of claim 1 wherein said oxygen stream is injected using an oxygen lance.

17. The process of claim 16 wherein the oxygen lance has a front injection nozzle.

18. The process of claim 17 wherein the oxygen lance front injection nozzle is straight.

19. The process of claim 17 wherein the oxygen lance front injection nozzle is inclined.

20. The process of claim 17 wherein the oxygen lance nozzle is a side injection nozzle.

21. The oxygen lance of claim 20 wherein said side injection nozzle has spaced side apertures.

22. The oxygen lance of claim 20 wherein side injection nozzle has swirling side apertures.

23. The process of claim 1 wherein said oxygen stream is injected using an oxygen ring.

24. The process of claim 1, the fuel duct having a straight portion interposed between the fuel exit plane and a curve, the straight portion having a length x;

the oxygen injection location being selected to be a distance e from the fuel exit plane; and

the fuel duct having an inner diameter D.

25. The process of claim 24 further comprising positioning the oxygen injection location to be greater than zero but less than 6 times D.

26. The process of claim 24 further comprising positioning the oxygen injection location to be greater than zero but less than x.

27. The process of claim 25 further comprising positioning the oxygen injection location to be greater than zero but less than x.

28. The process of claim 16, further comprising:

selecting a fuel duct having a terminal inner diameter D;

selecting an oxygen lance having a terminal inner diameter d;

orienting the oxygen lance in the fuel duct to extend in an injection direction, thereby defining an angle α to be the smallest angle formed between (1) a line extending from the lance terminal inner surface to the intersection of the fuel exit plane and the fuel duct terminal inner surface and (2) a line extending from the lance terminal inner surface in the injection direction to the fuel exit plane; and

positioning the oxygen lance in the fuel duct such that the oxygen injection location is located a distance e from the fuel exit plane, such that the tangent of the angle α is less than or equal to (D-d)/2(e).

29. The process of claim 28 in which the fuel duct extends in a direction substantially parallel to the direction of the oxygen lance injection direction.

30. The process of claim 28 in which the oxygen injection location is located approximately in the center of the fuel duct.

31. The process of claim 29 in which the oxygen injection location is located approximately in the center of the fuel duct.